

- 17 -

What is Claimed:

- 1 1. A positioning apparatus for positioning a test head for testing electronic components, said
2 positioning apparatus comprising:
 - 3 an outer cylinder;
 - 4 a support coupled to said outer cylinder for supporting the test head;
 - 5 a piston arranged within said outer cylinder, said piston and said outer cylinder defining a
6 fluid compartment within said outer cylinder;
 - 7 a pressure regulator for maintaining a pressure within said fluid compartment such that the
8 test head may be suspended in a substantially weightless position, said position being adjustable in a
9 vertical direction;
 - 10 a lifting device for raising and lowering said outer cylinder, said lifting device including a
11 drive mechanism coupled to the piston; and
 - 12 a drive apparatus for operating said drive mechanism to move the test head to a
13 predetermined position.
- 1 2. The positioning apparatus of claim 1 wherein said drive mechanism is a threaded drive
2 mechanism.
- 1 3. The positioning apparatus of claim 2 wherein said drive mechanism is a lead screw
2 mechanism.
- 1 4. The positioning apparatus of claim 1 wherein said fluid compartment is positioned above said
2 drive mechanism such that when said drive mechanism drives said fluid compartment in a vertical
3 direction, the test head is also driven in the vertical direction.
- 1 5. The positioning apparatus of claim 1 additionally comprising:
2 a position sensor for detecting a vertical position of the test head.
- 1 6. A positioning apparatus for positioning a test head for testing electronic components, said
2 positioning apparatus comprising:
3 a drive mechanism for moving the test head in a vertical direction; and

- 18 -

4 a pneumatic compliant coupling mechanism coupled to said drive mechanism, said pneumatic
5 compliant coupling mechanism supporting the test head in a substantially weightless condition and
6 providing a range of motion to the test head in the vertical direction, said pneumatic compliant
7 coupling mechanism being positioned above and secured to said drive mechanism such that said drive
8 mechanism moves said pneumatic compliant coupling mechanism when moving the test head in the
9 vertical direction.

1 7. The positioning apparatus of claim 6 wherein said drive mechanism is threaded.

1 8. The positioning apparatus of claim 6 wherein said pneumatic compliant coupling mechanism
2 includes a fluid compartment and a pressure regulator for maintaining a pressure within said fluid
3 compartment such that the test head may be suspended in the substantially weightless condition.

1 9. A method of positioning a test head for testing electronic components, said method
2 comprising the steps of:

3 (a) providing flow of a fluid into a fluid compartment coupled to the test head;

4 (b) mechanically moving the test head to a desired position in a vertical direction using a
5 drive mechanism after step (a); and

6 (c) fluidly suspending the test head in a substantially weightless condition by maintaining a
7 fluid pressure in the fluid compartment positioned between the test head and the drive mechanism.

1 10. The method of claim 9 further comprising a step of:

2 expanding and contracting the fluid compartment using a piston secured to the drive
3 mechanism.

1 11. The method of claim 9 further comprising a step of:

2 applying an external force to adjust the desired position of the test head.

1 12. The method of claim 9 further comprising a step of:

2 providing air flow into the fluid compartment such that the substantially weightless condition
3 of the test head is maintained.

1 13. The method of claim 9 further comprising a step of:

- 19 -

2 providing air flow out of the fluid compartment such that the substantially weightless
3 condition of the test head is maintained.

1 14. A positioning apparatus for a test head of an electronic testing system for testing electronic
2 components, said positioning apparatus comprising:

3 an inner cylinder;

4 an outer cylinder which is placed over the inner cylinder such that it can slide in a
5 longitudinal direction;

6 a carrier-arm device that carries the test head and is attached to the outer cylinder;

7 a lifting device for raising and lowering the outer cylinder;

8 a fluid-holding compartment that is provided inside the outer cylinder; and

9 a pressure generation device that is connected via a fluid line to the fluid-holding
10 compartment and is designed to generate a fluid pressure force directed counter to the weight of the
11 test head and the support arm device, wherein

12 the lifting device includes a piston arranged inside the outer cylinder, the outer cylinder can
13 slide in relation to the piston and the pressure in the fluid-holding compartment can be regulated via a
14 pressure regulation device in such a manner that the outer cylinder, together with the support arm
15 device and the test head, can be brought into a suspended position that is height-adjustable in relation
16 to the piston.

1 15. The positioning apparatus as recited in claim 14, wherein the lifting device comprises a lifting
2 rod that is adjustable in height by means of a threaded drive mechanism and carries the piston at a
3 top end of the lifting rod.

1 16. The positioning apparatus as recited in either of claim 14 or 15, wherein the lifting device
2 comprises a hollow lifting rod that can be adjusted in height via a threaded drive mechanism, the
3 threaded drive mechanism having a threaded drive centrally arranged inside the inner cylinder that is
4 introduced into the hollow lifting rod.

1 17. The positioning apparatus as recited in any of claims 14-16, wherein the fluid-holding
2 compartment is bounded at the top by a top end face of the outer cylinder and at the bottom by the
3 piston.

-20-

18. The positioning apparatus as recited in any of claims 14-17, wherein the pressure regulation device comprises a pressure regulator to maintain a constant pressure in the fluid line leading to the fluid-holding compartment, and in the fluid line a 3/2-way valve and a one-way restrictor are provided and are connected in parallel with one another.